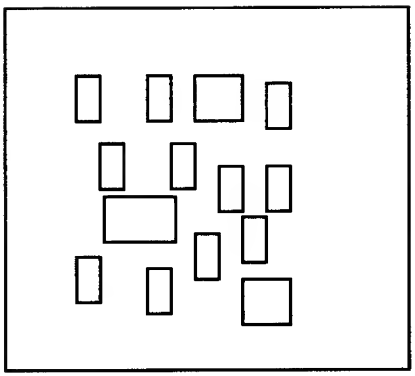


Fig. 1A

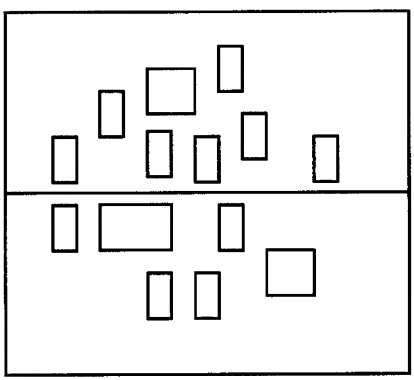


Fig. 1B

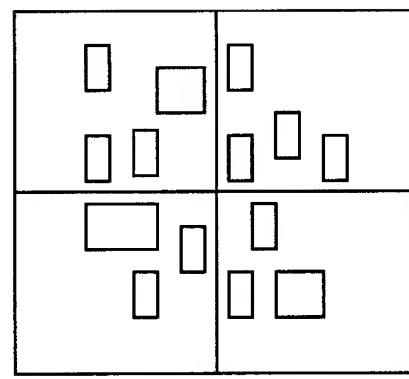
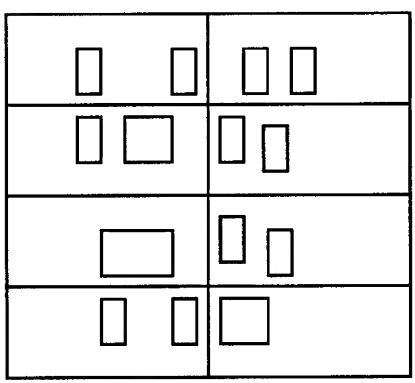


Fig. 1C



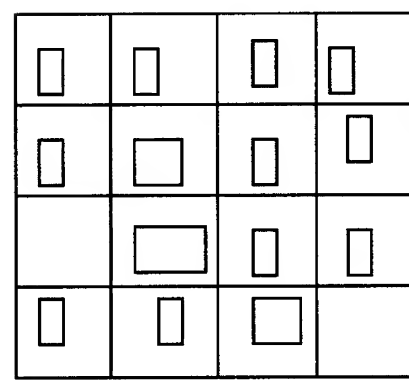


Figure 1 - PRIOR ART

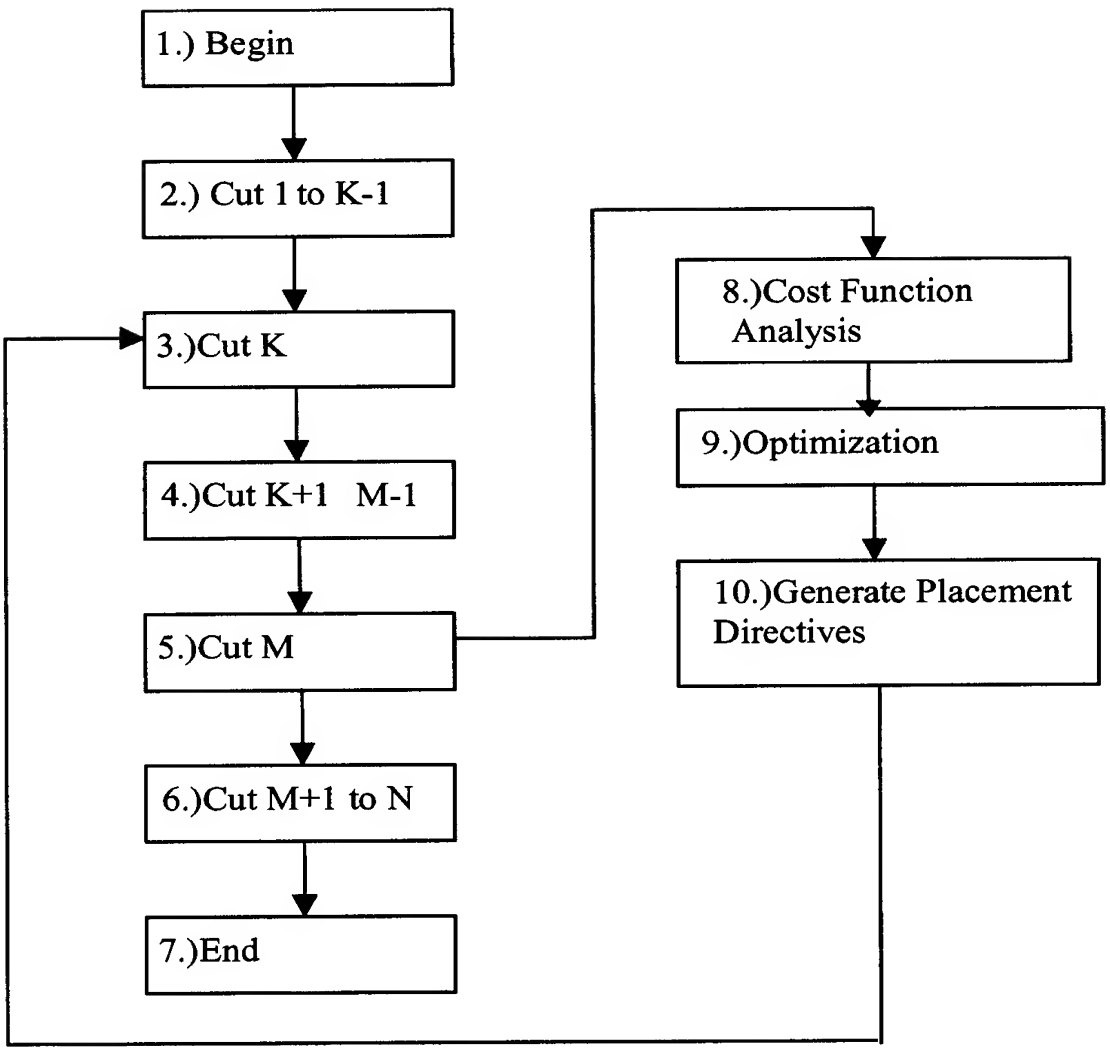

1.) Begin
2.) Cut 1 to K-1
3.)Cut K
4.)Cut K+1 M-1
5.)Cut M
6.)Cut M+1 to N
7.)End
8.)Cost Function Analysis
9.)Optimization
10.)Generate Placement Directives

Figure 2

```
1.      placement_flow(N)
        {
2.      K = user_specified_value;
3.      Look_ahead_factor = user_spedified_value;
4.      M = N * look_ahead_factor;

5.      do_M_cuts();
/* Next 3 lines: perform optimization (timing, power, congestion, signal integrity,
etc) */
6.        do_cost_function_analysis
7.        do_cost_function_optimization
8.        generate_placement_directives

9.        restore_placement_to_cut(K);
10.       do_remaining_cuts_K_to_N();
        }
```

Figure 3

```
1.          Placement_flow(N)
            {
2.          K = user_specified_value1;
3.          Look_ahead_factor = user_specified_value2;
4.          Forward_increment = user_spedified_value3;
5.          C = user_specified_value4;
6.          K = C – forward_increment;
7.          Do_K_cuts();  /* cut = K */

8.          M = N * look_ahead_factor;
9.          While ((iterations < max_iterations) & (K < N));   /* termination criteria */
    {
10.         restore_placement_for_cut_K(); /* cut = K */
11.         do_cuts_K_through_M();

12.     /* perform optimization (timing, power, congestion, signal integrity, etc) */

13.         do_cost_function_analysis()
14.         do_cost_function_optimization()
15.         generate_placement_directives()
16.         K = K + Forward_Increment;
17.         If(K > N) K = N;
18.         M = M + Forward_Increment;
19.         If ( M > N) M = N;
     }
20.         if (cut != N)
     {
21.         K = cut;
22.         Do_cuts_K_through_N();
     }
    }
```

Figure 4

```
1.          placement_flow(expansion_rate)
    {
2.          do_M_cuts();
3.          run_global_router();
4.          congestion_map = congestion_estimation();
5.          expand_cells (congestion_map, expansion_rate);
6.          insert_blockage(congestion_map);
7.          undo_cuts_K_to_M();
8.          do_remaining_cuts_K_to_N();
    }
9.          expand_cells (congestion_map, expansion_rate)
      {
10.         for each movable 1byn cell in a vertical congested grid
            {
11.               base_expansion =  base_expansion + pin_number / cell_width
12.               congested_cell_area = congested_cell_area + cell_width
            }
13.         target_expansion = congested_cell_area * expansion_rate
14.         K = target_expansion / base_expansion;
15.         for each movable 1byn cell in a vertical congested grid
            {
16.               new_cell_width =  cell_width  + pin_number / cell_width * K
17.               assign new_cell_width to the cell
            }
          }
18.         insert_blockage(congestion_map)
          {
19.         identify horizontal congested grids
20.         create rectangle regions by merging neighboring horizontal congested
            grids  for each region
            {
21.               N = blockages density, which is depend on congestion degree
22.               create blockage every N number of circuit row with one
                  circuit row high and region wide
            }
          }
```

Figure 5

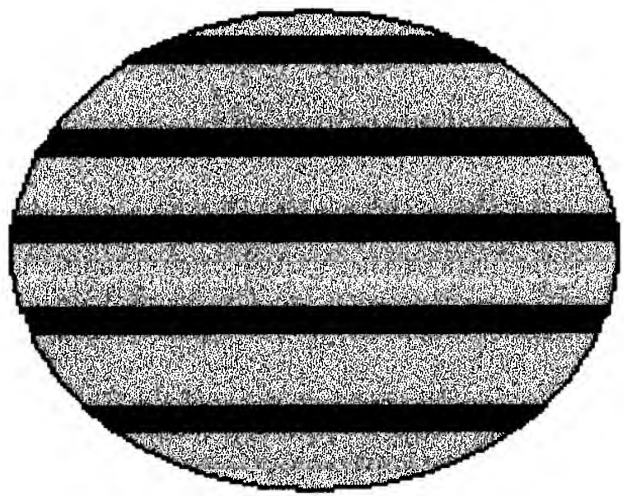


Figure 6

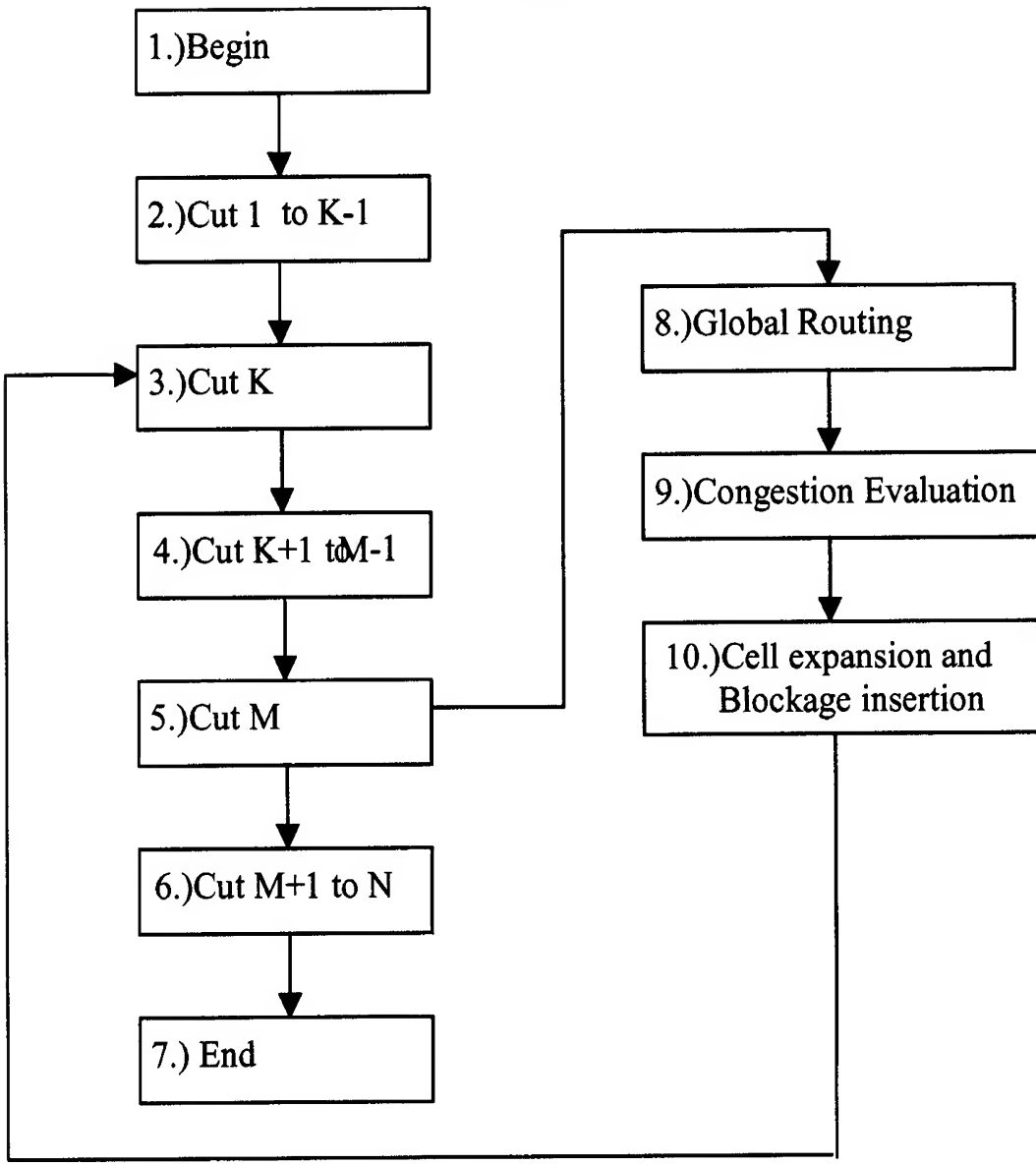

1.)Begin
2.)Cut 1 to K-1
3.)Cut K
4.)Cut K+1 to M-1
5.)Cut M
6.)Cut M+1 to N
7.) End
8.)Global Routing
9.)Congestion Evaluation
10.)Cell expansion and Blockage insertion

Figure 7

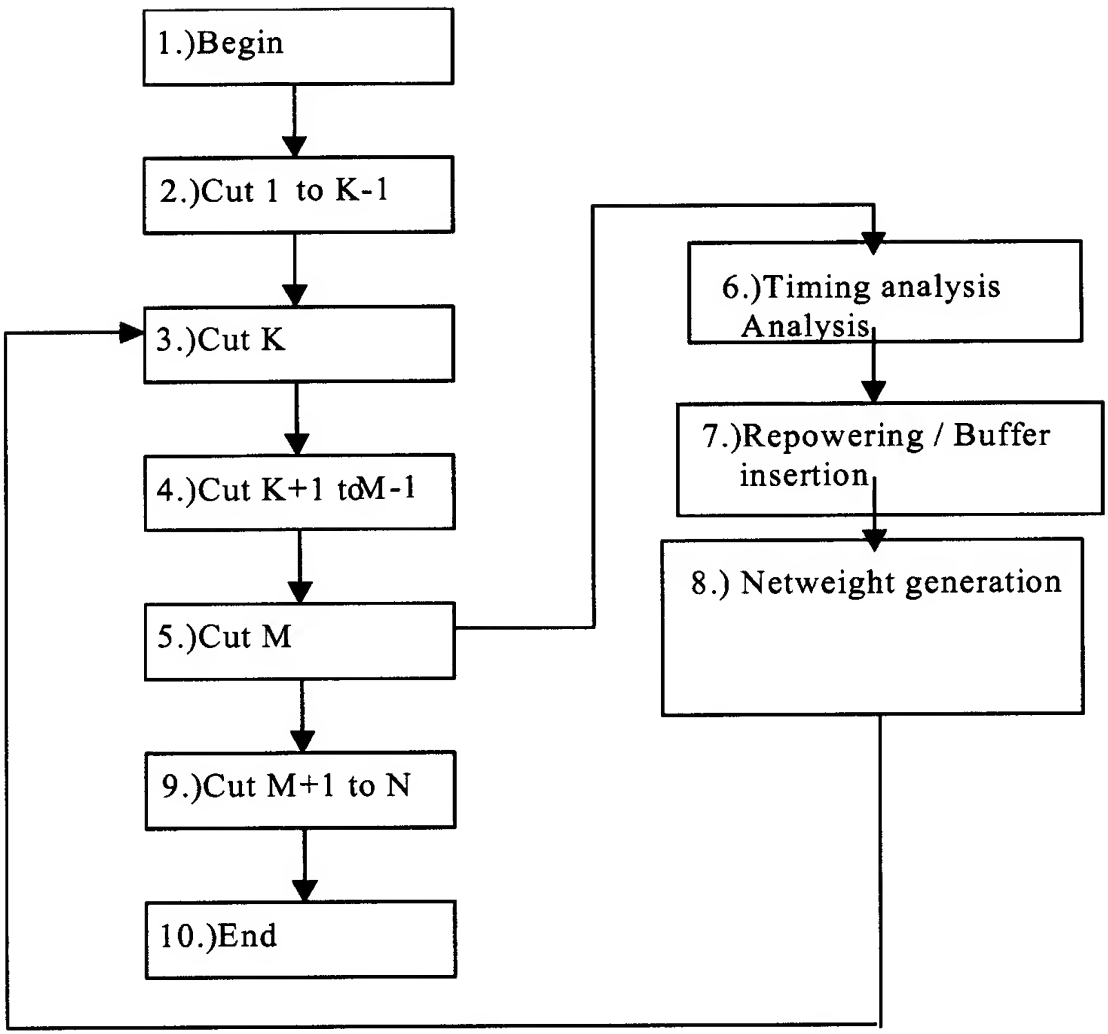

1.)Begin
2.)Cut 1 to K-1
3.)Cut K
4.)Cut K+1 toM-1
5.)Cut M
9.)Cut M+1 to N
10.)End
6.)Timing analysis Analysis
7.)Repowering / Buffer insertion
8.) Netweight generation

Figure 8